

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
19 June 2003 (19.06.2003)

PCT

(10) International Publication Number  
**WO 03/049929 A1**

(51) International Patent Classification<sup>7</sup>: **B29C 71/00**,  
45/33

(21) International Application Number: PCT/DK02/00769

(22) International Filing Date:  
15 November 2002 (15.11.2002)

(25) Filing Language: Danish

(26) Publication Language: English

(30) Priority Data:  
PA 2001 01722 19 November 2001 (19.11.2001) DK

(71) Applicant and

(72) Inventor: **GRAM, Jes, Tougaard** [DK/DK]; Biskop  
Svanes Vej 5, DK-3460 Birkerød (DK).

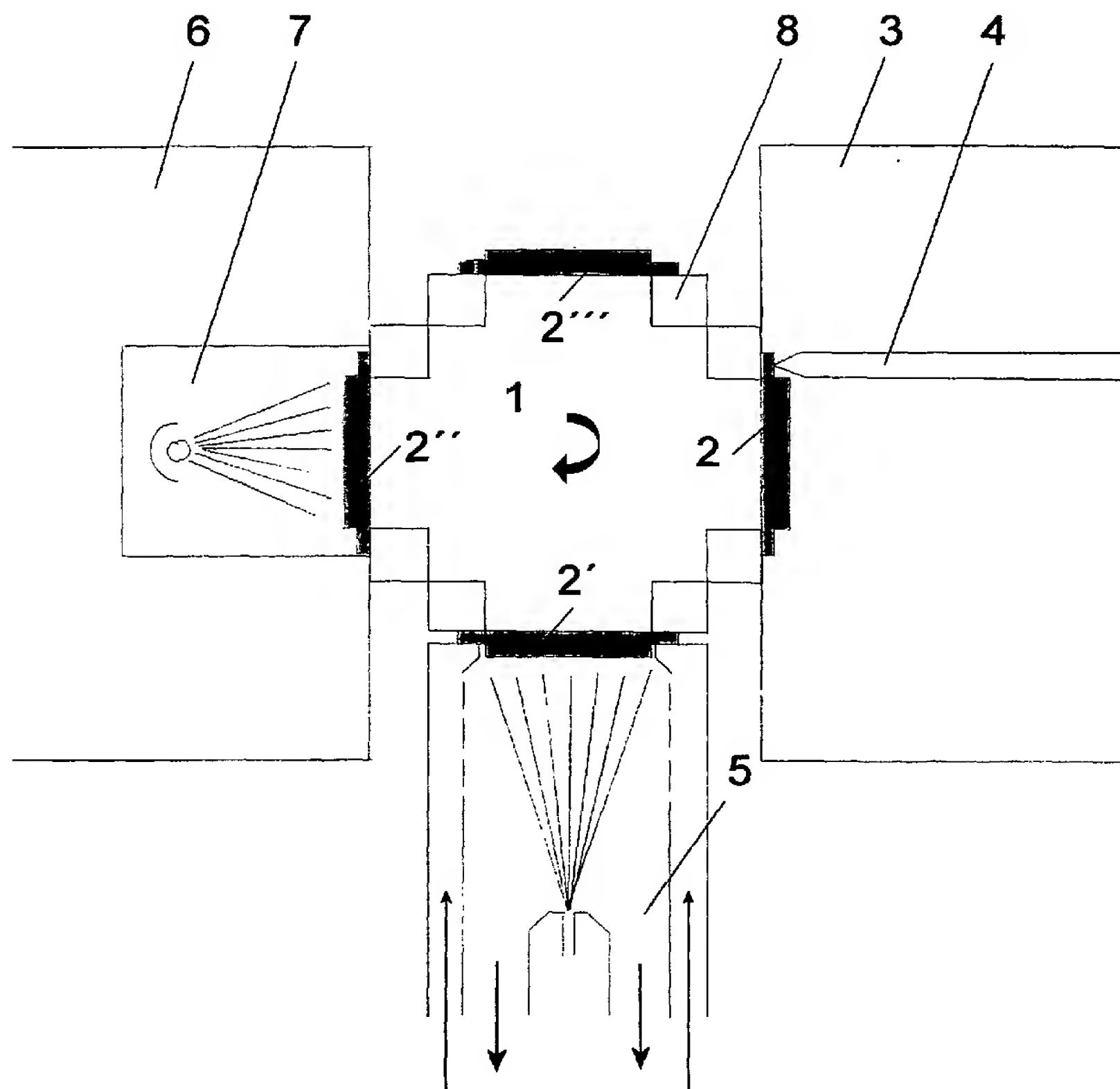
(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:  
— with international search report

[Continued on next page]

(54) Title: PAINTING AND HARDENING OF THE PAINT ON MOULDED PARTS IN A TOOL WITH A TURNABLE MOULD PART



(57) Abstract: The invention concerns a procedure and a mechanism for the painting/lacquering and the subsequent hardening of the paint/lacquer layer on a previous molded object (2) preferably of plastic. The invention is characterized by the fact, that all the mentioned processes are carried out in the same tool that performs the molding of the objects (2), which shall be painted/lacquered and hardened. This can be realized by the molding-tool, which can both be a one- and a multi-component tool, is supplied with at least one turnable mold part (1), which through stepwise turning, each of e.g. 90 degrees, leads the object through four stations, where the objects respectively are molded, painted/lacquered, hardened and finally ejected from the turnable mold part (1), wherein they after the molding and until the ejection has been positioned.



WO 03/049929 A1



---

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

Painting and hardening of the paint on moulded parts in a tool with a turnable mould part

The invention concerns a procedure and a mechanism for painting/lacquer and successive hardening of the paint/ lacquer on molded objects while they still occur/remain in their with at least one turnable mold-part provided mold-tool, which can be a one-component as well as a multi-component tool.

There are known a number of procedures for the molding of plastic objects with subsequent painting/ lacquer and hardening of the paint/ lacquer on the molded objects. These hitherto known methods involve however a lot of handling and transport of the objects with robots in dust free environments. With the new procedure according to the invention both painting/ lacquer and hardening of the objects can be carried out while they still remains in the tool in which they are molded, which allows great savings through a faster and more secure production and an easier controllable dust free environment.

The procedure and the mechanism according to the invention are characterized by the fact, that the paint/ lacquer is applied to the object in a position at least one station/ stage after the molding and preferably while the mold is closed, after which the painted/ lacquered object by a controlled enlightening from a UV light source or another kind of energy supply is hardened, preferably after the turnable mold part is turned at least one more station further ahead.

The additional embodiments and advantages from the procedure and the mechanism according to the invention will appear from the drawing, where

fig. 1 shows a cross section of a tool according to the invention seen from above with all the four stages in a production cycle shown at the same time, and

fig. 2 shows a cross section of a mechanism for the applying of paint/ lacquer, here a nozzle placed in a double walled telescope with belonging masking for the covering of the object.

On fig. 1 there is seen from above shown a cross section of a tool according to the invention in a closed position. The turnable mold part 1 is here shown as a square with cut off corners and with the objects 2, 2', 2'' and 2''' shown in four various stages placed on each of the four sides of the turnable mold part 1. The object 2 has just been molded between the turnable mold part 1 and the stationary mold part 3 through the inlet 4. The object 2' is shown a station further ahead after the opening of the mold, turning of the turnable mold part 1 90 degrees clockwise and closing of the mold. In this on the

figure shown as the lowest position of the turnable mold part 1 the molded object 2', still firmly placed on the turnable mold part 1, are being applied a preferably thin layer of paint/ lacquer, in this case from a special applying device 5. As for the object 2" it is turned additional 90 degrees forward after the opening of the mold and subsequent re-closing, and it is now placed between the movable mold part 6, which is shown with a built in UV light source 7, and the turnable mold part 1, in which it still remains. It is in this station the applied layer of paint/ lacquer is hardened. Finally the object 2''' shown in the uppermost position of the figure after additional a turning of the turnable mold part 90 degrees clockwise just before the object as complete/finish molded, painted/ lacquered and hardened is ejected from the turnable mold part 1 by means of the stripper plate 8. It is seen, that the objects 2, 2', 2" and 2''' describes a complete cycle for the production of a molded, painted/ lacquered and hardened object. After one more opening of the mold and an additional turning of 90 degrees as well as closing of the mold, the tool according to the invention is back in its initial position and ready for a new cycle, starting with the injection of new material through the inlet 4 in the stationary mold part 3.

Fig. 2 shows the special mechanism 5 for the applying of the paint/ lacquer layer on the object. It consists of a nozzle 9, which is situated in a double walled telescope mechanism 10, wherein there can be produced an under-pressure, an over-pressure, turbulence or other forms of air streams, which can serve to apply a paint/ lacquer -suitable and controlled atmosphere around the object 2', plus prohibit surplus paint/ lacquer in being spread out in the tool, when this is opened and is turned. Furthermore there is on the figure shown a masking 11, the purpose of which is to cover the areas of the object, which shall not be, applied paint/ lacquer.

On the drawing there could also have been shown other embodiments of the mechanism according to the invention, e.g. where the turnable mold part was designed mainly as a regular hexagon or a regular octagon. There would thus be more stations during the turning, where e.g. an additional cooling could happen or a hardening of the paint/ lacquer. This could also be effectuated with a turning table or an index plate system with more stations instead of the shown system with a turnable middle section. There could as well have been shown a tool with two or more turnable mold parts, just as there could have been shown tools according to the invention with two or more inlets, so there also could have been demonstrated multi- component molding. But the on the drawing shown should be sufficient to explain the fundamental principles in the procedure and the mechanism according to the invention.

The molded objects, which in the previous mentioned above are mainly plastic objects. But the procedure and the mechanism according to the invention can also be applied on objects molded in metals as aluminum and magnesium, in different alloys or in other moldable materials.

## Claims:

1. Procedure and a mechanism for the varnishing/lacquering and the subsequently hardening of the paint/lacquer on molded objects (2), while these are still remaining in their with at least one turnable mold-part (1) supplied molding tool, which can be a one-component as well as a multi-component tool, c h a r a c t e r i z e d by the fact, that the paint/lacquer is applied on the object in a position at least one station after the molding and preferably while the tool is closed, after which the painted/lacquered object through a controlled enlightening from an UV light source (7) or another kind of energy supply is hardened, preferably after the turnable mold part (1) is turned at least one station further ahead.
2. Procedure and mechanism as mentioned in claim 1, c h a r a c t e r i z e d by the fact, that the mechanism (5) for applying of the paint/lacquer has a double-walled telescope mechanism (10) or a similar mechanism, wherein there can be produced under-pressure, over-pressure as well as other kinds of air streams, which can serve for the establishing of a paint/lacquer - suitable and controlled atmosphere around the object (2).
3. Procedure and mechanism as mentioned in at least one of the other claims, c h a r a c t e r i z e d by the fact, that the objects for the painting/lacquering and the hardening in all their cycles, from their molding until they completely finished are ejected from the tool, are placed firmly in the turnable mold part(s) (1).
4. Procedure and mechanism as mentioned in at least one of the other claims, c h a r a c t e r i z e d by the fact, that the for the hardening serving mechanism embodied by an UV light source (7) or another kind of energy supply is placed in a telescope mechanism or in a similar closed environment to obtain optimal circumstances for the hardening.
5. Procedure and mechanism as mentioned in at least one of the other claims, c h a r a c t e r i z e d by the fact, that the tool is designed with an encapsulating or similar, so the object (2) after the painting/lacquer can be subjected to under-pressure, heating, cooling or another kind of influence, which can minimize the time for the vaporization of the solvents and/or plastizisers in the paint/lacquer used.

6. Procedure and mechanism as mentioned in at least one of the other claims, characterized by the fact, that the tool is designed with a clean-room encapsulation or similar, so that the object (2) during the whole cycle of the process can be subjected to under-pressure, heating, cooling or other kinds of influence, which can minimize the quantity of dust or other pollution.

7. Procedure and mechanism as mentioned in at least one of the other claims, characterized by the fact, that the tool is designed with extra stations, maskings or the like, so that there can be applied more than one layer of paint/lacquer of the same or a different sort/kind.

8. Procedure and mechanism as mentioned in at least one of the other claims, characterized by the fact, that the tool is designed with mechanisms for the carrying out of electrostatic painting/lacquering, so that the necessary quantity of the paint/ lacquer is minimized, just as the formation of dust and other pollution is brought down to a minimum.



1/2

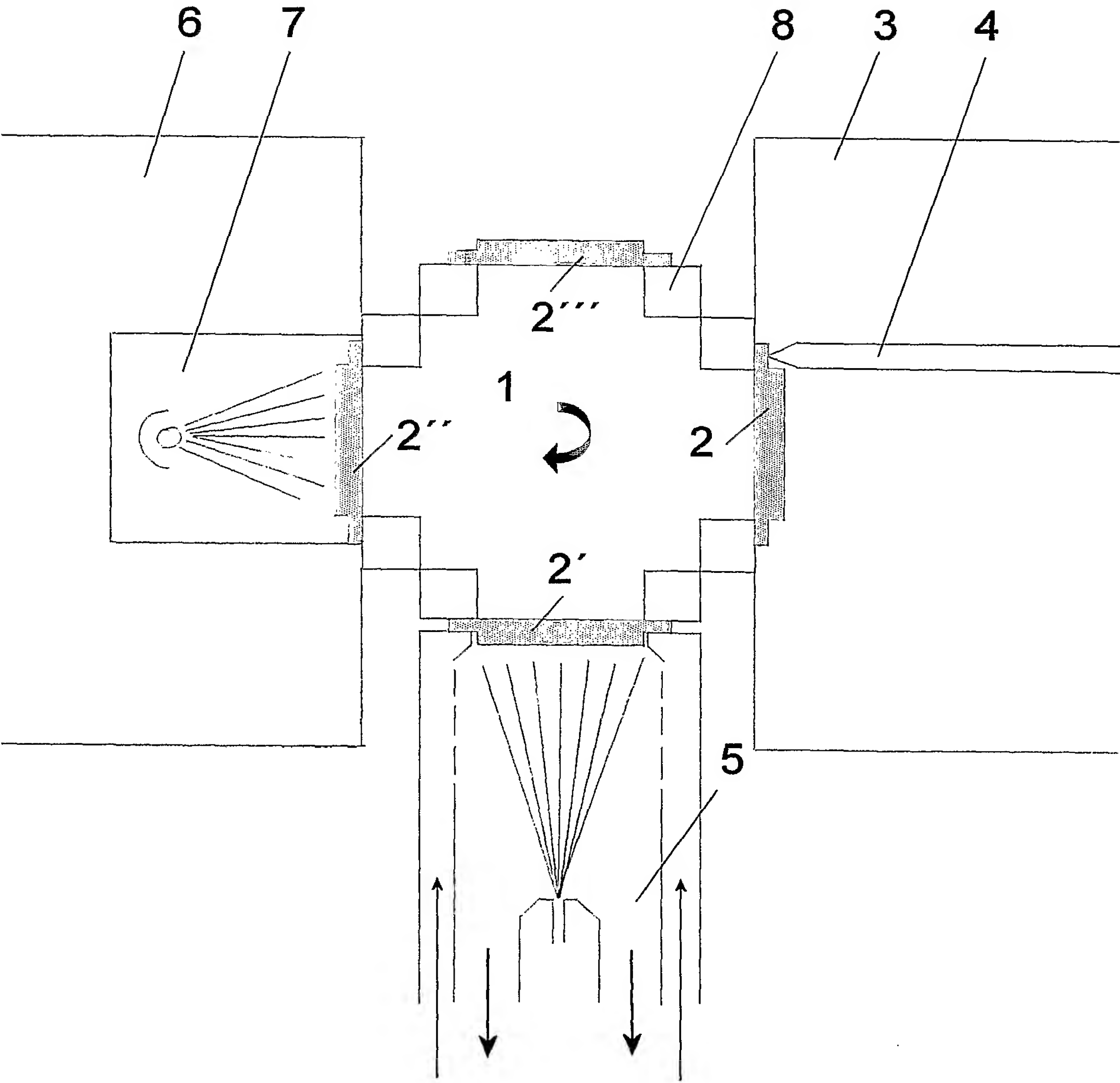


Fig. 1



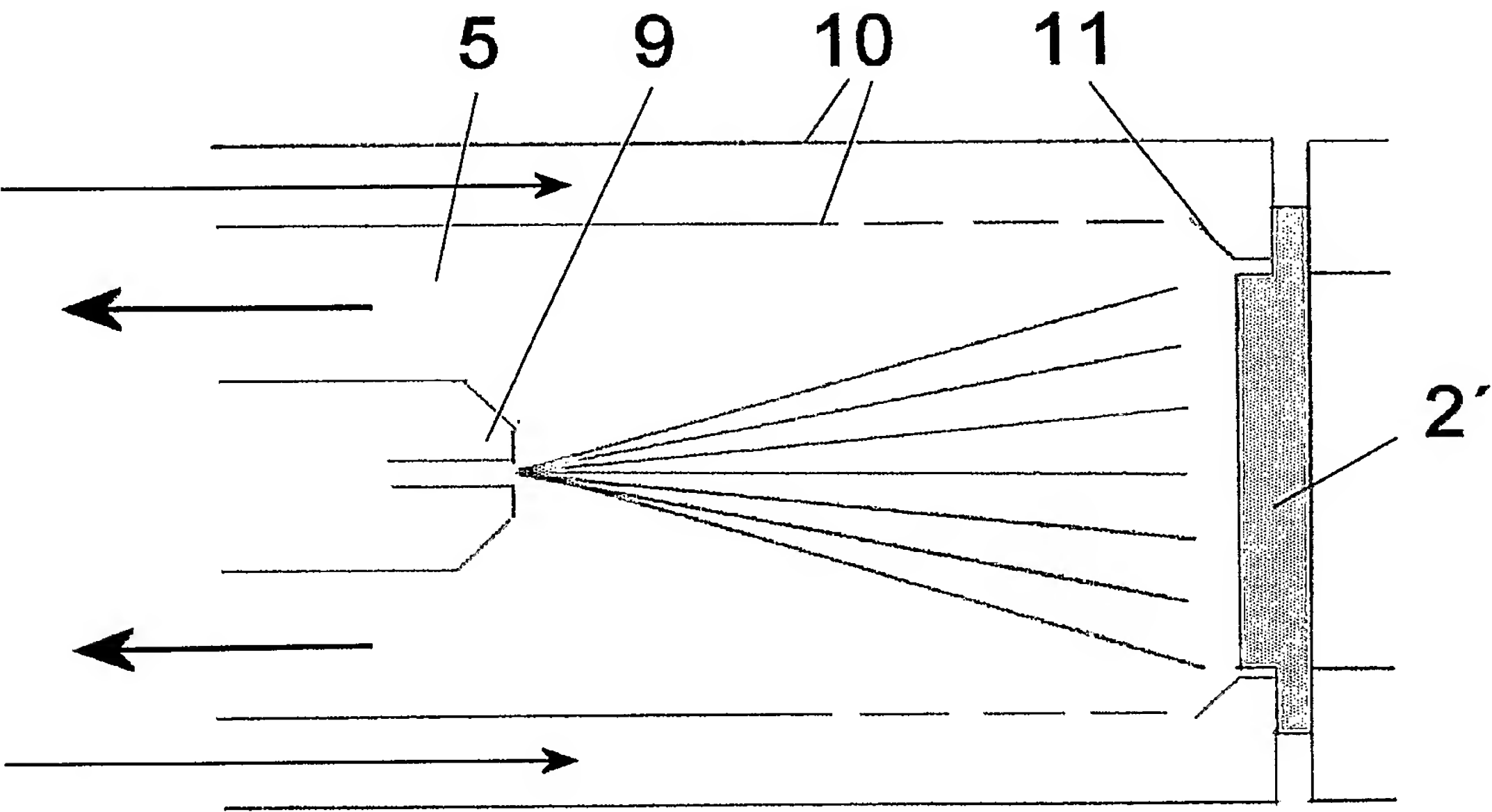


Fig. 2

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 02/00769

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B29C 71/00, B29C 45/33

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B29C, B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI DATA, EPO-INTERNAL

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
EX	US 2003/0038407 A1 (ALAIN BETHUNE), 27 February 2003 (27.02.03), page 5, line 25 - line 27; page 2, line 61 - page 3, line 78  --	1,3-8
X	EP 0953419 A2 (L'OREAL), 3 November 1999 (03.11.99), column 5, line 50 - column 6, line 65, figures 1-6	1,3-8
Y	--	2
Y	US 5254164 A (MATSUNAGA MASAHUMI), 19 October 1993 (19.10.93), column 4, line 52 - column 5, line 8, figure 1, abstract  --	1-8

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

31 March 2003

Date of mailing of the international search report

03-04-2003

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

Lars Hennix/MP  
Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 02/00769

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 012, no. 384, 13 October 1988 (1988-10-13) & JP 63135213 A (HASHIMOTO FORMING CO LTD), 07 June 1988 (1988-06-07) abstract  --	1-8
Y	US 2410532 A (J.D. TESSIER), 5 November 1946 (05.11.46), column 2, line 1 - line 11, abstract  --	2
A	DATABASE WPI Week199622 Derwent Publications Ltd., London, GB; Class P42, AN 1996-216379 & JP 8080456 A (SUZUKI KK), 26 March 1996 (1996-03-26) figure 1; abstract  --	2
A	EP 1264675 A2 (HUSKY INJECTION MOLDING SYSTEMS LTD.), 11 December 2002 (11.12.02), abstract  --	1-8
A	US 6468458 B1 (TERRY L. ANDERSON ET AL), 22 October 2002 (22.10.02), abstract  -- -----	1-8

# INTERNATIONAL SEARCH REPORT

Information on patent family members

28/02/03

International application No.

PCT/DK 02/00769

Patent document cited in search report			Publication date	Patent family member(s)			Publication date
US 2003/0038407 A1			27/02/03	NONE			
EP 0953419 A2			03/11/99	FR 2778134 A,B			05/11/99
US 5254164 A			19/10/93	CA 2097046 A			16/12/93
				CN 1080572 A			12/01/94
				JP 6320075 A			22/11/94
				JP 7085786 B			20/09/95
US 2410532 A			05/11/46	NONE			
EP 1264675 A2			11/12/02	EP 1072379 A,B			31/01/01
				AT 219719 T			15/07/02
				AT 230334 T			15/01/03
				DE 69713533 D,T			27/02/03
				DE 69718218 D			00/00/00
				EP 0794045 A,B			10/09/97
				JP 2997431 B			11/01/00
				JP 10000645 A			06/01/98
				US 5750162 A			12/05/98
				US 5817345 A			06/10/98
				US 5728409 A			17/03/98
				US 5830404 A			03/11/98
US 6468458 B1			22/10/02	AU 1217100 A			15/05/00
				BR 9914701 A			16/10/01
				CA 2339367 A			04/05/00
				EP 1124579 A			22/08/01
				JP 2002528291 T			03/09/02
				WO 0024421 A			04/05/00